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Modeling Flexible Exchange Rate USD / MAD

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Abstract: ***This article discusses the impact of the dirham's flexibility on foreign exchange risk management and presents techniques for hedging this risk. The econometric approach used is the modeling of the flexible exchange rate USD / MAD***

Keywords: exchange rate, Morocco, USD, MAD econometric, model

Abbreviation: TC: exchange rate

1. Introduction

In Morocco, the problem of currency risk did not arise to the extent that the exchange rate regime was fixed. From 1973, with the liberalization of foreign trade and the exchange rate regime, there is a shift from a uni-monetary anchoring system to a multi-monetary system from a basket of currencies of the main partners and a gradual shift of the Dirham followed by a devaluation of 16.50% in 1983, thus the modification of the weights of the basket respectively in 1980, 1999, 2001 and 2015.

The subject of the paper is a USD / MAD flexible exchange rate modelling test: methodology and empirical study using the Box and Jenkins model under Eviews. The article is composed of three sections, the first section deals with a review of the literature on exchange rate modelling, the second section will present the methodology in the third section, we will present application with the results of the estimation of the model Box and Jenkins and his various tests.

2. Literature Review

Foreign exchange risk is the risk of loss related to changes in exchange rates, these variations having a positive or negative effect on the flow of expenditure and revenue of the company which has repercussions on the cost of raw materials, revenues related to the sale of merchandise, but also financial flows relating to borrowing and investment in foreign currencies, the profitability of the enterprise and its book value. There are three types of foreign exchange risk, namely: foreign exchange transaction risk, accounting exchange risk and economic or operational currency risk.

Since 1994, emerging markets have suffered a succession of currency crises. A common feature of these crises is that they have hit countries that have chosen nominal pegging strategies based on the exchange rate. On the contrary, it appeared that emerging countries with no currency peg had escaped the contagion of currency crises. From this succession of crises emerged the consensus that intermediate exchange rate regimes could not constitute a credible policy.

The relevance of this new consensus has been the subject of intense debate. Empirically, numerous studies have shown the persistence of intermediate regimes even after the exchange crises of the 1990s (Levy-Yeyati and Sturzenegger (2005)); (Bénassy-Quéré and Coeuré (2000)); (Masson (2001)). Calvo and Reinhart (2001 and 2002), for their part, identified a fear of floating linked to the fact that currency depreciations do not have the same effects in emerging markets as in developed countries.

Frankel (1999 and 2004) challenged the theoretical under pinnings of this consensus, pointing out, on the one hand, that he ignores the fact that there is a wide spectrum in the possible choice of the degree of exchange rate flexibility and, on the other hand, On the other hand, given the variety of shocks that affect economies, and taking into account their evolution over time, thereis no a priori exchange rate regime that is optimal at any point in time. Authorities must therefore arbitrate between the benefits and costs of rigidity and flexibility[1].

One type excludes the presence of foreign currencies in the composition of the agents' portfolio. This hypothesis, originally developed by Tobin in 1969, then taken up in a study by Branson, Halttunen and Masson in 1977, explains the portfolio reallocations that give rise to deficits or surpluses in the current account.

A second type, on the other hand, considers an economy in which the assets held by the agents are perfectly substitutable. More precisely, they hold indifferently in their portfolio of the national currency or foreign currencies. It shows that substitution behaviours between currencies call into question the independence of monetary policies in a flexible exchange rate regime.

Section 2: Exchange Rate Modeling Methodology

To model the Moroccan flexible exchange rate, we will opt for the method of Box and Jenkins, this method inspired by the work of G. BOX and G. JENKINS (in the seventies) contributed a lot in theory and practice. Time series models. The objective to be answered in their book, "Time Series Analysis; Forecasting and Control ", is to build a random model ARMA type to reproduce the best achievements of a time series. The study of a series for forecasting, using the methodological approach of Box and Jenkins, goes through the following five steps:

[1]HAOUAOUI. L, ALLERGET. JP, AYADI. M, « Un modèle de choix de régime de change: Aspects théoriques et analyse empirique », Tunis, 2006, P3

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- The study of stationarity (ADF tests, graphs)
- Identification of the appropriate process (reading correlograms)
- The estimation of the optimal model / process retained
- Statistical inference (diagnosis / validation of the estimated model)
- Prediction.

Data:
In order to conduct our work well, we will use bi-monthly data covering the period from January 2018 to December 2019. This period is characterized by a flexible exchange rate. The statistical database is collected from the Forex website. The data considered for this purpose fortnightly and the period chosen for January 16, 2018 which dates the beginning of the application of the flexible exchange rate regime in Morocco until December 16, 2018, so the series consists of 23 observations.

Section 3: Application
We will build an ARMA model from the exchange rate series. The study of the series through the approach of the method of Box and Jenkins allows us to better capture the best model that will be used to make these forecasts.

• Graphical analysis of the series:

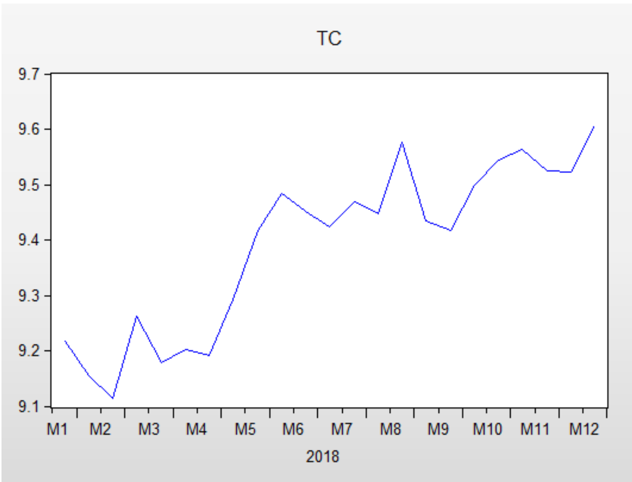


Figure 1: Graph of the evolution of the exchange rate of the dollar against the dirham
Source: graph established by us under views using database (annexe 1)

The graph above describes the evolution of the flexible USD / MAD exchange rate from January 2018 to December 2018. This evolution seems to be characterized by an uptrend, in this case we will say that the TC series is not stationary, the graphic examination does not always make it possible to determine with certainty the existence of a trend. In order to remove the uncertainty, we use the correlogram and the Dickey-Fuller test.
• Analysis of the correlogram:

Date: 08/28/19 Time: 21:04
Sample: 1/16/2018 12/16/2018
Included observations: 23

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.805	0.805	16.933	0.000
		2	0.658	0.030	28.801	0.000
		3	0.517	-0.060	36.492	0.000
		4	0.437	0.085	42.274	0.000
		5	0.314	-0.149	45.429	0.000
		6	0.137	-0.267	46.059	0.000
		7	-0.007	-0.063	46.061	0.000
		8	-0.063	0.117	46.215	0.000
		9	-0.104	-0.022	46.657	0.000
		10	-0.118	0.071	47.274	0.000
		11	-0.159	-0.031	48.486	0.000
		12	-0.248	-0.299	51.711	0.000

Figure 2: Correlogram of the exchange rate of the dollar against
Source: graph established by us undereviews

We notice that simple autocorrelations are almost all different from zero and decrease slowly. The first partial autocorrelation is very significantly different from zero. This structure is that of a non-stationary series. Therefore, we use the Dickey-Fuller-Augmented Unit Root Test (ADF) which is the most relevant in the study the stationarity of the series.

• TC Stationarity Study: Unit Root Test
The Dickey-Fuller test allows us to test the stationarity of our series while taking into account the autocorrelation of disturbances. To do this, under Eviews, we will practice the unit root test for the three models specified by (ADF).

➢ Model 3: Pattern with trend and constant:

In this model, we test two hypotheses:
- H0: The absence of the trend;
- H1: The existence of a trend.

Null Hypothesis: TC has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.904188	0.1800
Test critical values:	1% level	-4.440739	
	5% level	-3.632896	
	10% level	-3.254671	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TC)
Method: Least Squares
Date: 08/28/19 Time: 21:09
Sample (adjusted): 2/01/2018 12/16/2018
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TC(-1)	-0.600529	0.206780	-2.904188	0.0091
C	5.504325	1.891569	2.909926	0.0090
@TREND("1/16/2018")	0.012782	0.004754	2.688454	0.0145

R-squared	0.308964	Mean dependent var	0.017725
Adjusted R-squared	0.236223	S.D. dependent var	0.074911
S.E. of regression	0.065468	Akaike info criterion	-2.488380
Sum squared resid	0.081436	Schwarz criterion	-2.339602
Log likelihood	30.37218	Hannan-Quinn criter.	-2.453333
F-statistic	4.247465	Durbin-Watson stat	1.827734
Prob(F-statistic)	0.029872		

Figure 3: TC Unit root test
Source: graph established by us undereviews

The series has a unit root since the probability is greater than 5% (P-value = 0.18>0.05), the trend is significant because the probability of the trend is less than 5% (P-value = 0.0145<0.05) we accept hypothesis H1: the existence of the tendency. Hence, the series is stationary of the Trend Stationary (TS) type. We move to model (2) according to the ADF test.

➢ Model 2: Model without trend and with constant:

In this model, we test two hypotheses:
- H0: The absence of the constant;
- H1: The existence of the constant.

Null Hypothesis: TC has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.982985	0.7407
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TC)
Method: Least Squares
Date: 08/28/19 Time: 21:10
Sample (adjusted): 2/01/2018 12/16/2018
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TC(-1)	-0.107716	0.109580	-0.982985	0.3374
C	1.028210	1.028100	1.000107	0.3292

R-squared	0.046086	Mean dependent var	0.017725
Adjusted R-squared	-0.001609	S.D. dependent var	0.074911
S.E. of regression	0.074972	Akaike info criterion	-2.256909
Sum squared resid	0.112415	Schwarz criterion	-2.157723
Log likelihood	26.82600	Hannan-Quinn criter.	-2.233544
F-statistic	0.966260	Durbin-Watson stat	2.191135
Prob(F-statistic)	0.337357		

Figure 4: TC Unit root test
Source: graph established by us undereviews

We notice that the series has a unit root because (P-value = 0.7407>0.05), the constant is not significant because we have the probability related to the constant is 0.3292 greater than 5%. So, we accept H0. We then go to model (1) without constant and without trend.

➢ Model 1: Model without trend and without constant:

In this model, we test two hypotheses:
- H0: The series is not stationary;
- H1: The series is stationary.

Null Hypothesis: TC has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.093501	0.9230
Test critical values:	1% level	-2.674290	
	5% level	-1.957204	
	10% level	-1.608175	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TC)
Method: Least Squares
Date: 08/28/19 Time: 21:11
Sample (adjusted): 2/01/2018 12/16/2018
Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
TC(-1)	0.001863	0.001704	1.093501	0.2866

R-squared	-0.001619	Mean dependent var	0.017725
Adjusted R-squared	-0.001619	S.D. dependent var	0.074911
S.E. of regression	0.074972	Akaike info criterion	-2.299018
Sum squared resid	0.118036	Schwarz criterion	-2.249425
Log likelihood	26.28919	Hannan-Quinn criter.	-2.287335
Durbin-Watson stat	2.326742		

Figure 5: TC Unit root test
Source: graph established by us undereviews

The seriesis not stationary of type TS, since (P-value = 0.9230>0.05). So, we accept H0.

To remove the trend, we propose to study the series with the following equation:

Estimation Command:
=========================
LS TC C @TREND

Estimation Equation:
=========================
TC = C(1) + C(2)*@TREND

Substituted Coefficients:
=========================
TC = 9.16769673913 + 0.0202866205534*@TREND

Note that the series obtained is a stationary series because (P-value = 0.00<5%).

• Modeling of the series without trend:

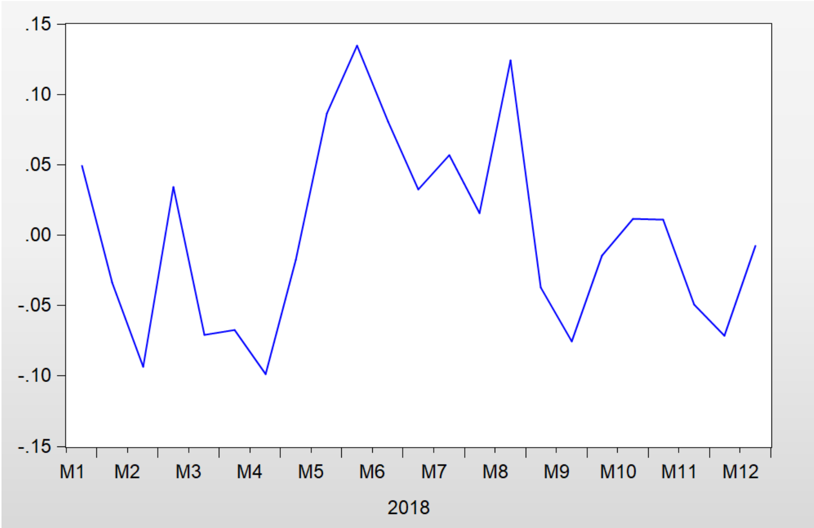


Figure 5: Graph of TC series modeling without trend
Source: graph established by us undereviews

We find that the series fluctuates around the average, so the series is stationary.

• Identification of the ARMA model by the method of Box and Jenkins:

The DTC series is stationary, to identify the appropriate process in the ARMA family (p, q) that is likely to reproduce the operating mode of the DTC series, we first refer to the correlogram of the stationary series DTC, then will judge the significance and goodness of the model.

Date: 08/28/19 Time: 21:20
Sample: 1/16/2018 12/16/2018
Included observations: 23

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.400	0.400	4.1732	0.041
		2	0.080	-0.095	4.3474	0.114
		3	-0.030	-0.033	4.3737	0.224
		4	0.008	0.049	4.3757	0.358
		5	0.061	0.048	4.4953	0.481
		6	-0.245	-0.355	6.5224	0.367
		7	-0.462	-0.306	14.201	0.048
		8	-0.354	-0.072	19.016	0.015
		9	-0.063	0.112	19.180	0.024
		10	-0.048	-0.155	19.281	0.037
		11	-0.003	0.104	19.281	0.056
		12	-0.201	-0.282	21.384	0.045

Figure 6: Correlogram of the DTC series
Source: graph established by us undereviews

To know the orders of the ARMA model (p, q), we will use a correlogram of the stationary series DTC. Indeed, the simple correlogram allows us to identify a model AR (p), while the partial correlogram allows to retain a model MA (q). It can be seen from the correlogram that the terms are within the confidence interval and that all critical probabilities of the Ljung-Box statistic are greater than 5%. With the exception of the term AR (1), MA (1) and AR (7).

• Estimation of the ARIMA model:

Let the model to beestimated: ARIMA (1, 1, 1). We estimate the model under Eviews:

Dependent Variable: DTC
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 08/28/19 Time: 21:50
Sample: 1/16/2018 12/16/2018
Included observations: 23
Convergence achieved after 35 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(1)	0.236373	0.573156	0.412406	0.6844
MA(1)	0.192282	0.550280	0.349426	0.7304
SIGMASQ	0.003615	0.001524	2.371720	0.0279

R-squared	0.170972	Mean dependent var	-7.87E-15
Adjusted R-squared	0.088069	S.D. dependent var	0.067522
S.E. of regression	0.064481	Akaike info criterion	-2.515793
Sum squared resid	0.083155	Schwarz criterion	-2.367685
Log likelihood	31.93162	Hannan-Quinn criter.	-2.478544
Durbin-Watson stat	1.954365		

Inverted AR Roots	.24
Inverted MA Roots	-.19

Figure 6: ARMA model estimation
Source: graph established by us undereviews

After estimating the model, the analysis of the significance of the coefficients leads to not keeping the model above because the probability is greater than 5%.

Let the model to be estimated: ARIMA (7, 1, 1). We estimate the model under Eviews:

Dependent Variable: DTC
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 08/28/19 Time: 21:57
Sample: 1/16/2018 12/16/2018
Included observations: 23
Convergence achieved after 19 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(7)	-0.500281	0.277295	-1.804148	0.0863
MA(1)	0.201383	0.222045	0.906945	0.3752
SIGMASQ	0.002763	0.000969	2.852490	0.0098

R-squared	0.366511	Mean dependent var	-7.87E-15
Adjusted R-squared	0.303162	S.D. dependent var	0.067522
S.E. of regression	0.056366	Akaike info criterion	-2.703338
Sum squared resid	0.063542	Schwarz criterion	-2.555230
Log likelihood	34.08838	Hannan-Quinn criter.	-2.666089
Durbin-Watson stat	1.924491		

Inverted AR Roots	.82-.39i	.82+.39i	.20-.88i	.20+.88i
	-.56-.71i	-.56+.71i	-.91	
Inverted MA Roots	-.20			

Figure 7: ARMA (7, 1, 1) model estimation
Source: graph established by us undereviews

After estimating the model, the analysis of the significance of the coefficients leads to not keeping the model abovebecause the probability is greater than 5%.

Let the model to be estimated: ARIMA (7, 1, 0). We estimate the model under Eviews:

Dependent Variable: DTC
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 08/28/19 Time: 21:54
Sample: 1/16/2018 12/16/2018
Included observations: 23
Convergence achieved after 10 iterations
Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
AR(7)	-0.560646	0.264230	-2.121808	0.0459
SIGMASQ	0.002835	0.001062	2.668610	0.0144

R-squared	0.349860	Mean dependent var	-7.87E-15
Adjusted R-squared	0.318901	S.D. dependent var	0.067522
S.E. of regression	0.055725	Akaike info criterion	-2.738973
Sum squared resid	0.065212	Schwarz criterion	-2.640234
Log likelihood	33.49819	Hannan-Quinn criter.	-2.714140
Durbin-Watson stat	1.525914		

Inverted AR Roots	.83+.40i	.83-.40i	.20-.90i	.20+.90i
	-.57-.72i	-.57+.72i	-.92	

Figure 7: ARMA (7, 1, 0) model estimation
Source: graph established by us undereviews

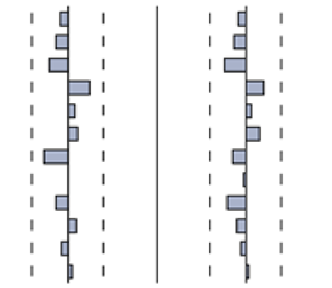
After estimating the model, the analysis of the significance of the coefficients leads to keeping the model above. According to the results, this model will subsequently be subjected to a diagnostic test.

- Validation of the model:

➢ Autocorrelation test of residues;

For this model to be statistically adequate, the perturbations must not be self-correlated. To verify this hypothesis, we use the Ljung-Box test:

Date: 08/28/19 Time: 22:05
Sample: 1/16/2018 12/16/2018
Included observations: 23



	AC	PAC	Q-Stat	Prob
1	-0.093	-0.093	0.2250	0.635
2	-0.127	-0.136	0.6635	0.718
3	-0.220	-0.252	2.0502	0.562
4	0.268	0.212	4.2194	0.377
5	0.084	0.081	4.4443	0.487
6	0.119	0.168	4.9213	0.554
7	-0.277	-0.147	7.6792	0.362
8	0.015	-0.021	7.6874	0.465
9	-0.124	-0.205	8.3238	0.502
10	0.090	-0.104	8.6850	0.562
11	-0.079	-0.060	8.9849	0.623
12	0.060	0.039	9.1762	0.688

Figure 8: Autocorrelation test of residues
Source: graph established by us undereviews

We can observe that all the simple and partial autocorrelation terms are within the confidence interval and the gains associated with the Ljung-Box statistics are all greater than 5%. We do not reject the null hypothesis of non-correlation of errors. The correlogram therefore suggests that our residues follow a white noise.

➢ Test of normality of residues

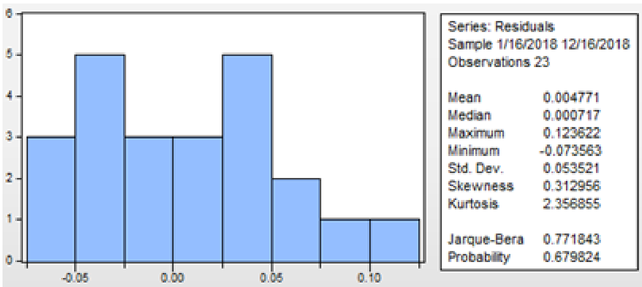


Figure 9: Graph of the test of normality of residues
Source: graph established by us undereviews

It is found that the probability associated with the Jarque-Bera test is greater than 5% (Probability = 0.771843>0.05), which confirms that the residues are normal.

- Forecast :

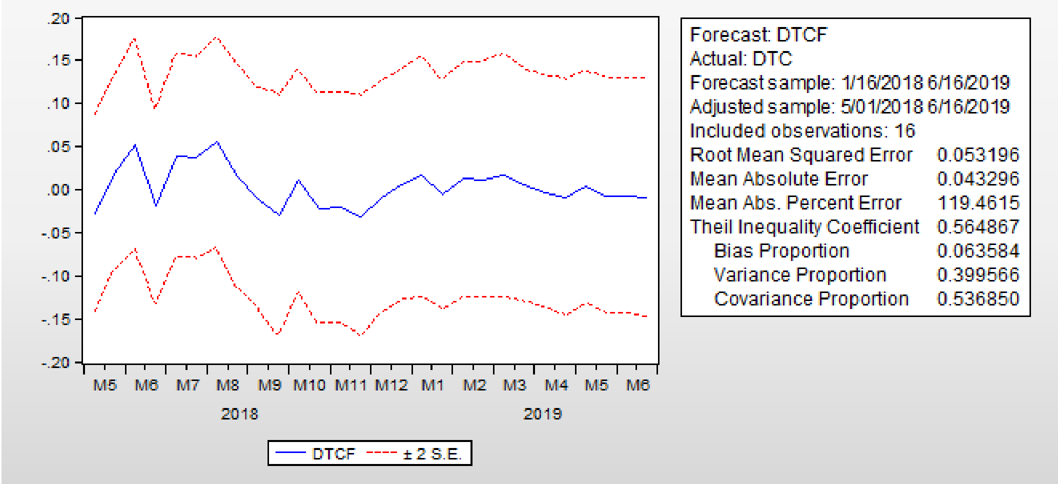


Figure 10: Graph of the exchange rate forecast USD / MAD in 2019
Source: graph established by us undereviews

- Equation of the obtained model:

Estimation Command:
=========================
LS(OPTMETHOD=OPG) DTC AR(7)

Estimation Equation:
=========================
DTC = 0 + [AR(7)=C(1),UNCOND, ESTML= "1/12/2018 12/16/20

Forecasting Equation:
=========================
DTC = 0 + [AR(7)=C(1),UNCOND, ESTML= "1/12/2018 12/16/20

Substituted Coefficients:
=========================
DTC = 0 + [AR(7)=-0.560646349229,UNCOND, ESTMPL="1/12/2

- 2019 exchange rate forecast

12/16/2018	9.614002	-0.007322
1/01/2019	NA	9.634289
1/16/2019	NA	9.654576
2/01/2019	NA	9.674862
2/16/2019	NA	9.695149
3/01/2019	NA	9.715435
3/16/2019	NA	9.735722
4/01/2019	NA	9.756009
4/16/2019	NA	9.776295
5/01/2019	NA	9.796582
5/16/2019	NA	9.816869
6/01/2019	NA	9.837155
6/16/2019	NA	9.857442

Foreign exchange risk analysis within the company :

The analysis of the foreign exchange risk concerning the cash of the company "OLYMPE" consists in applying the exchange rates to the 2019 calendar to release the unrealized gains and losses on the debts.

Schedule of foreign suppliers:

Table 1: Foreign Debtors Debt Schedule in USD Currency.

Date	Debt($)	Average historical price	Debt(MAD)	price Forecast Eviews	Provisional disbursement	Forecast gain	Forecast loss
01/01//2019	8 178,43	9,55441	78 140,07	9,634289	78 793,36	0	-653,28
01/16/2019	8 436,00	9,53007	80 395,67	9,654576	81 446,00	0	-1 050,33
02/01/2019	16 637,08	9,53081	158 564,85	9,674862	160 961,45	0	-2 396,60
02/16/2019	51 692,49	9,53876	493 082,26	9,695149	501 166,39	0	-8 084,14
03/01/2019	106 091,89	9,55638	96 537,49	9,715435	1 030 728,86	0	-934 191,37
03/16/2019	78 527,10	9,59197	753 229,59	9,735722	764 518,02	0	-11 288,43
04/01/2019	70 254,00	9,66075	678 706,33	9,756009	685 398,66	0	-6 692,33
04/16/2019	401,5	9,59384	3 851,93	9,776269	3 925,17	0	-73,25
05/01/2019	2 790,92	9,64777	26 926,15	9,796582	27 341,48	0	-415,32
05/16/2019	6 093,54	9,64645	58 781,03	9,816869	59 819,48	0	-1 038,45
06/01/2019	103 191,68	9,70993	1 001 983,99	9,837155	1 015 112,55	0	-13 128,56
06/16/2019	83 227,80	9,66262	804 198,60	9,857442	820 413,21	0	-16 214,61
Total	535 522,43		4 234 397,96		5 229 624,63	0	-995 226,67

Source: established by us based on the forecast data

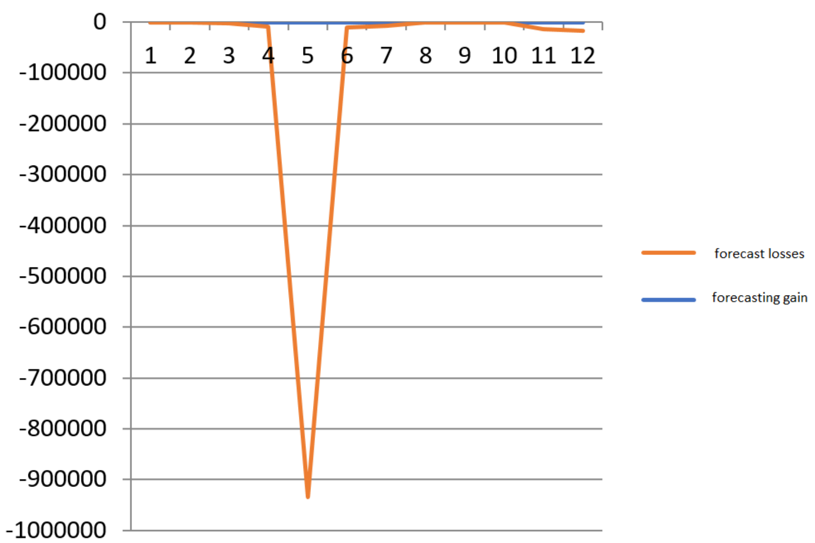


Figure 11: Graph of the exchange risk exposure of the company "OLYMPE"

The foreign exchange risk graph explains large and recurring unrealized losses with a total of - 995 226 and latent gains not present.

• Currency risk analysis:

Table 2: Summary of the currency risk

	Debt ($)	Debt (MAD)	Provisional disbursement (MAD)	Forecast gain	Forecast loss
Total	535 522,43	4 234 397,96	5 229 624,23	0	-995 226,67
%/ Debt (MAD)			123,50%	0%	23,50%

The summary table of the foreign exchange risk shows that the total unrealized loss represents 25.50% of the total debt to be repaid and the total latent gain represents 0%.

• Flexible USD / MAD exchange rate volatility analysis

Table 3: Flexible USD / MAD exchange rate volatility

	Historical course	Forecast Eviews
Min	9,53007	9,634289
Max	9,70993	9,857442
Average	9,62	9,745865
Standard Deviation	0,08993	0,1115765
Coefficient of variation	0.9%	1.11%

The foreign exchange volatility analysis chart shows that the total unrealized loss returns on the one hand, at significant forward prices with an average of 9.745865 against lower historical prices with an average of 9.62. On the other hand, historical prices and forward prices are stable with a respective coefficient of variation of 0.9% and 1.11%.

3. Conclusion

Managers must therefore choose between the advantages and the obstacles of the fixity and flexibility of the exchange rate regime.

In a second section, we presented the methodological process of exchange rate modeling using the Box and Jenkins method. This is a method based on the study of a series for the purpose of forecasting, goes through the following five steps: the study of stationarity by ADF tests and graphics. Secondly, the identification of the appropriate process through the reading of the correlograms. Then, the estimation of the optimal model chosen to finally diagnose and validate the chosen model, which will allow to proceed to the forecast of the series.

It is in the last section that we try to answer the question around which this memoir is erected we are interested in series of exchange rate of the US dollar (USD) compared to the Moroccan dirham (MAD), representing the official quotations of these spot parities collected from the Forex site over a period stretching from 16/01/2018 to 16/12/2018, characterized by the launch of the new flexible exchange rate regime. The volatility of the exchange rate forces the company studied to pay more attention to the hedging of the exchange rate risk thanks to the techniques offered on the interbank market mentioned above, since the exposure to currency risk increases more and more. because of the rise in forward exchange rates, which affects the cash flow of the company in question. Given this situation and in the absence of awareness of hedging instruments, futures (futures), currency options and currency swaps have been proposed as the most realistic instruments given the simplicity and availability of their implementations.

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Annexe 1: data base.

Date	Taux de change USD/MAD
16/01/2018	9.21673
01/02/2018	9.15421
16/02/2018	9.11461
01/03/2018	9.26264
16/03/2018	9.17792
01/04/2018	9.20201
16/04/2018	9.19058
01/05/2018	9.29253
16/05/2018	9.41623
01/06/2018	9.48480
16/06/2018	9.45128
01/07/2018	9.42350
16/07/2018	9.46803
01/08/2018	9.44731
16/08/2018	9.57606
01/09/2018	9.43470
16/09/2018	9.41672
01/10/2018	9.49809
16/10/2018	9.54435
01/11/2018	9.56427
16/11/2018	9.52387
01/12/2018	9.52242
16/12/2018	9.60668